TECHNICAL NOTES

LAKE STATES FOREST EXPERIMENT STATION
U.S. DEPARTMENT OF AGRICULTURE · · FOREST SERVICE

No. 432

Cover Crops Afford First-Year Protection for Forest Plantations Against Late Spring Frosts

In flat areas of poor air drainage and temperature inversion, newly planted trees may obtain considerable protection from late spring frost injury by the use of cover crops. This was shown by tests made in the Argonne Experimental Forest in northeastern Wisconsin.

In the spring of 1950, white spruce, sugar maple, and white ash trees, all 6 to 8 inches tall, were planted on an open sodded flat. The area had been thoroughly cross-disked on August 23, 1949. Shortly thereafter one portion was seeded with rye and another portion with red clover. The remainder was left unseeded to be invaded by such vegetation as would come back naturally, notably quack grass and bluegrass.

On the night of June 16 and morning of June 17, 1950, a moderately severe frost occurred with a minimum temperature of around 26° F. The plantings were all examined 3 days later to determine how the various species had reacted to the protection of the cover crops. At the time of examination the natural bluegrass and quack grass were 18 inches high but rather too thin in overall density to give any measure of protection. The red clover was only 5 inches high and gave no more protection than did the thin scattered grass. The rye, however, was 48 inches tall and had a good density--sufficient to give considerable protection to the trees.

The table (on back of this sheet) shows that rye was of especial benefit in reducing damage to the frost-sensitive broadleaf species. In the case of sugar maple the rye furnished 100 percent protection against frost damage to the new foliage. Only about half as much moderate and severe damage combined occurred to the white ash trees with rye cover as to those in the unseeded plot or in the plot with clover. The damage to spruce was rather minor, but only 1 percent of those trees planted in rye were damaged compared with 16 percent slightly damaged where there was no cover crop.

Frost damage of any consequence (moderate to severe) was found correlated with the amount of protective cover around each tree. For broadleaves combined, this damage was 63 percent where only 20 percent of the trees had adequate cover; it was 47 percent where 40 percent of the trees had adequate cover, and only 10 percent damage where 80 percent of the trees had adequate cover.

The rye has the disadvantage of being only an annual crop and would need reseeding every year. Hence, investigations are under way on other aspects of the problem, including planting of nurse crops of comparatively frost-hardy aspen and paper birch; these will be underplanted with spruce after 8 or 10 years or when a fairly dense canopy has been established. Birch has been used for many years in Germany and Sweden as an anti-frost crop for underplanted spruce and occasionally for oak.

July 1955

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MAINTAINED AT ST. PAUL 1, MINNESOTA, IN COOPERATION WITH THE UNIVERSITY OF MINNESOTA

Comparative late spring freezing damage to three tree species in three cover crop conditions

Species planted	Type of cover crop	Percent of trees in each frost damage class				
		No damage	Light damage	Moderate damage	Severe damage	Moderate and severe damage combined
2-2 white spruce	None	84	16	0	0	0
	Red clover	43	45	11	1	12
	Rye	99	1	0	0	0
2-0 sugar maple	None	55	24	14	7	21
	Red clover	45	27	21	7	28
	Rye	100	0	0	0	0
2-0 white ash	None	7	28	40	25	65
	Red clover	6	36	39	19	58
	Rye	17	48	24	11	35
All species combined	None	48	23	18	11	29
	Red clover	31	36	24	9	33
	Rye	72	16	8	4	12